Revaluing Waste in New York City: Planning for Small-Scale Compost

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ABSTRACT

One-third of the municipal solid waste stream is organic material that, when processed in landfills, produces methane, a highly potent greenhouse gas. Composting is a proven strategy for organic waste management, which also creates a nutrient-rich soil amendment. This thesis begins with a review of three North American cities (Portland, Toronto, San Francisco) that have implemented successful composting programs, but rely on trucking the material to distant processing facilities. In New York City, the Department of Sanitation has not yet implemented a citywide composting program. In this thesis I explore four small-scale compost programs in New York City. I find that citizens, working outside the purview of city government, have developed their own innovative, local approaches to composting, which suggest viable alternatives to trucking. New York has a proven capacity for managing compost locally; I argue that these models should be replicated throughout the city. I conclude that to process organic waste material properly, it should be reclassified as a food product, and its management shifted to a new city agency that would launch and support local compost programs. Case studies are compost programs operating in Central Park, Battery Park City, Fort Greene community gardens, and the North Brooklyn Compost Project in McCarren Park.

In memory of my grandmother
Lillian Schwichtenberg Neilson
1913-1996

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On a crisp sunny Saturday last October, I visited the North Brooklyn Compost Project in McCarren Park. During my half-hour visit, ten or twelve park neighbors stopped by with bags and plastic containers filled with organic kitchen waste, which they emptied in to chest-high plastic tumblers. People said hello to each other while Compost Project volunteers checked the food waste to be sure it wasn't contaminated with plastics or non-compostables. Another volunteer showed me around the various compost bins at their project site while explaining their compost operation, highlighting features such as the large number of worms and their home-made wooden bins. Neighbors stopped on their way to pick up their CSA box[1] or walking their dog to the adjacent dog run. Sister Miriam, a nun who lives nearby, made her weekly visit to drop her food waste.

By delivering food waste to the Compost Project, residents were keeping it out of landfills while helping to create a valuable soil amenity. Organic waste makes up approximately 30 percent of the municipal solid waste stream in the United States (EPA 2006, 4). Composting is widely understood as a practical way to reduce the amount of organic waste that reaches landfills. Composting can also reduce the pollution, noise, and traffic that are generated from trucking garbage to transfer stations and far-flung landfills. In addition, composting organic waste prevents the production of methane, a highly potent greenhouse gas. Meanwhile, compost is a nutrient-rich material commonly used to improve soil quality for farming and plantings, and has also been proven to break down chemicals in contaminated soil.

And yet, despite its potential benefits, most city dwellers do not compost. There are many reasons for this, which range from individual habits and municipal policies that don't support compost, to space limitations, concerns about odors and vermin, and a lack of convenient compost options in their city. Yet several things stood out

1 CSA, Community Supported Agriculture. When local farms provide delivery of produce to a neighborhood pick-up location.

for me from my brief visit to the North Brooklyn Compost Project. People had separated and carried their food waste to the park with them; no one seemed "grossed out" by the situation; people enjoyed the social aspect of the errand; and they were learning about how compost happens. What struck me most, however, was that all of these people actually cared about creating something valuable out of their food waste. In spite of the extremely small scale of the operation, they wanted to participate. In this highly localized environment, community-organized, volunteer-based compost is working. Does this mean that locally organized compost could be a key element of waste management planning in dense urban areas? If composting can convert one-third of the municipal solid waste stream into a valuable amenity, what models can cities learn for integrating compost into their waste management strategies more effectively?

I investigate this question in the context of New York City, which has a proven capacity for small-scale compost programs. At the same time, New York's long-term sustainability plan, PlaNYC 2030, suggests many ways in which locally produced compost will be invaluable as the city moves forward with its goals. From PlaNYC's Brownfields Initiative to its commitment to improve upon the existing 29,000 acres of park land, New York will have substantial need for compost for the next several decades.

Right now, hundreds of citizens are participating in successful local compost programs, run by small groups of volunteers. They are carrying out impressive collective planning practices, designed "from the bottom-up," and turning a waste product into a valuable amenity. These programs, however, lack the broad institutional support that could keep them going in the long term.

New York should build on this trend of neighborhood-based organics management and establish a city agency that has re-classified organic material as the useful food that it really is, not as the waste it has become.

Garbage History in the 19th and 20th Centuries

Understanding the origin and evolution of the existing system is crucial in taking steps to change it. Waste has changed substantially in the past few hundred years since the Industrial Revolution. Cities have changed and grown exponentially, the automobile has come to dominate the landscape, and the United States has ad-

opted a culture in which many day-to-day items are disposable. Susan Strasser, in *Waste and Want*, describes the meticulousness that accompanied early 19th century waste management practices. From saving grease for reuse or to make soap, to saving scraps of cloth to make quilts, the household of the early 19th century produced very little waste because so much was constantly being repurposed and reused (Strasser 1999, 6).

Furthermore because domestic chores had been primarily within the scope of women's work, and trash production occurred primarily at home, for generations women handled the sorting and removal of trash. Waste was managed along with other household projects like food production and livestock management. Much of the organic waste was thrown out into the streets. This practice supported a large population of pigs in the streets and alleys of New York City for much of the 19th century. The pigs were an essential part of organic waste management, living off the food scraps and other organic materials left for disposal. Some of the poorest New Yorkers tended the pigs, keeping them as livestock and relying on them as a meat source (Corey 2004). While I'm not advocating for a return to pig farming in the streets of New York, this example demonstrates that New Yorkers were separating their organic waste; the people who tended the pigs understood that waste could be revalued to create food. Even as late as the 1960s, hog farmers and private waste haulers still picked up food waste from restaurants, bakeries, and hotels and delivered it directly to the region's hog farms. This practice kept the nutrients in kitchen waste in circulation as part of the food cycle. By 1968, the Regional Plan Association predicted that this practice would eventually stop, as hog farming moved further and further away from the city center (Regional Plan Association 1968, 56).

As waste volumes and management technologies became more complex over the decades, the network shifted to technically trained, certified professionals in the field of sanitation engineering. To this day, the management of organic waste remains within the purview of city agencies and sanitation engineers.

Around the middle of the 20th century, a few key developments coincided to create the landfill culture that we experience today. In the period from the 1960s to the 1990s, the volume of municipal solid waste increased dramatically. Estimates range from a doubling per capita (Berger 2006, 186) to a quadrupling overall (Rogers 2007, 8). The advent of plastic and paper disposable containers generated

higher levels of waste nationwide (Rogers 2007, 118). These disposable containers generated higher profits for producers of beverages such as beer and soda pop (Rogers 2007, 117).[2] As waste increased, so did the number of landfills and dumping areas. Few of these dumping areas operated as sanitary landfills,[3] and even those were rarely operated according to local regulations (Regional Plan Association 1968, 56). These unregulated dumping areas were breeding grounds for insects and rodents.

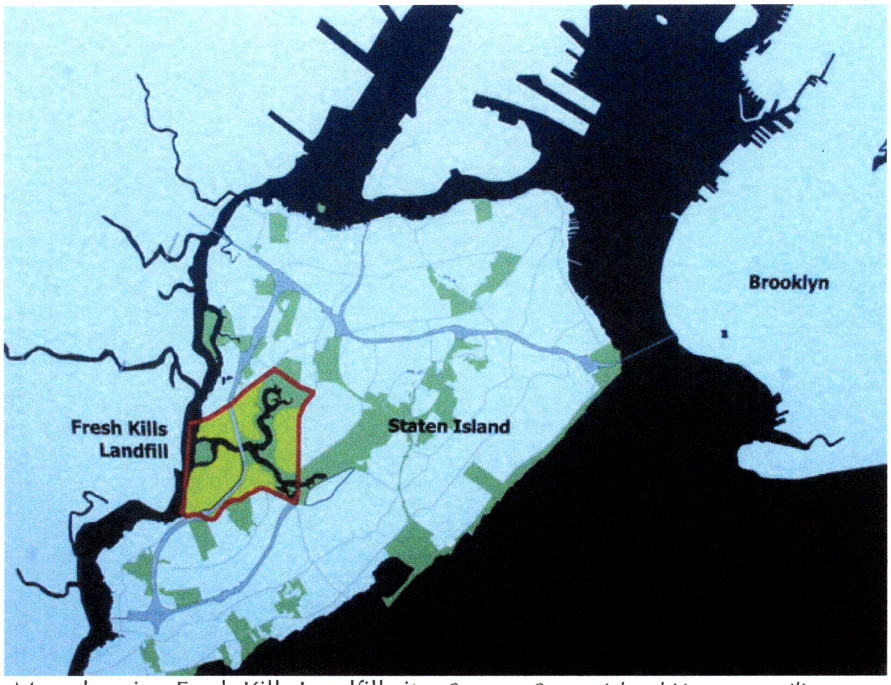
Open dumping area, pre-RCRA. *Source: Regional Plan Association*

Responding to the increase in volumes of waste and dumps from all sectors of society, the federal government enacted the Solid Waste Disposal Act in 1965. Nine years later, Congress strengthened the Act by passing the Resource Conservation and Recovery Act (RCRA) of 1976. RCRA was meant to address the increasing problems that resulted from our growing volume of municipal and industrial waste. It set national goals for protecting human health and the environment from the potential hazards of waste disposal, conserving energy and natural resources, reducing the amount of waste generated, and ensuring that wastes are managed in an environmentally-sound manner (U.S. E.P.A. 2009). RCRA regulated solid waste, hazardous waste, and underground storage. Most notably, this act prohibited the open dumping of solid waste, which caused the rapid closure of dramatic numbers of landfills. Since the passage of RCRA, the number of public and private landfills in the U.S. decreased from 20,000 in the 1970s to 2268 by 1999 (Berger 2006, 186). By 2006, there were just 1,754 landfills (EPA 2006, 8).

2 Similar patters can be seen in other product lines such as food packaging and the transition to disposable diapers.

3 Sanitary landfills are defined by the practice of placing a layer of soil over the fresh piles of garbage each day.

This pattern was echoed in New York City with many city dumps closing during that period. By 1991, New York's last operating landfill was Fresh Kills on Staten Island.



Map showing Fresh Kills Landfill site. *Source: Staten Island Live www.silive.com*

The new RCRA-sanctioned "sanitary" landfills were fewer and farther between. And yet, they weren't quite out of reach; the new national highway system facilitated long-distance trucking of garbage in ways that might have seemed unimaginable in previous years. When Fresh Kills was finally closed in 2002, New York began shipping its waste to landfills in Pennsylvania, Virginia and elsewhere (New York City Parks and Recreation 2009).

For all its success with regard to regulating the hazardous impacts of solid waste management, RCRA doesn't describe the various types of waste that are to be landfilled; all types of garbage were treated equally. Previously separated and re-used organic materials were added to the mix of waste that was gathered up and sent to landfills.

Thus, waste amounts have increased, while the ever-growing piles of garbage have been traveling greater and greater distances before they finally rest in landfills. Current waste management strategies are not sustainable, in the sense of "sustainable," as defined by United States Environmental Protection Agency: "meeting the needs of the present without compromising the ability of future generations to meet their own needs."

In just a few generations of urbanization and industrial development, the job of waste management, like so many other roles in private life, shifted from the individual woman at home to the city management, and then—by 1965—to a nationally-regulated network of landfills and highways. That's a long way from throwing it in the street to feed the pigs.

Reconfiguring Economies

Circumstances are changing, though. The outward-spreading transportation and land use patterns of the twentieth century are being challenged by alternatives that rethink unregulated horizontal expansion of cities (which is sometimes called sprawl). As fuel prices fluctuate and Americans are growing weary of traffic, noise and pollution, they are also gaining a renewed appreciation for more dense and walkable urban forms. New ways of thinking about urban space and city design have also arisen in movements such as New Urbanism and Transit-oriented development. The popularity of these concepts can be seen in the revival of many US downtowns since the 1970s, and new suburban developments that market "walkability" as part of their lifestyle appeal. Not all of these options are successful or viable, but they have become an important part of the conversation about how cities should be made and how people want to live.

Meanwhile the global economic downturn and the collapse of the housing market are causing upheaval and uncertainty at many levels of government and in private life. We face a period of transition when it is appropriate to evaluate existing systems for their effectiveness. Other methods might suit us better. Thomas Friedman, the *New York Times* columnist, echoed widespread sentiment when he wrote in March of this year:

> Let's today step out of the normal boundaries of analysis of our economic crisis and ask a radical question: What if the crisis of 2008 represents something much more fundamental than a deep recession? What if it's telling us that the whole growth model we created over the last 50 years is simply unsustainable economically and ecologically and that 2008 was when we hit the wall — when Mother Nature and the market both said: "No more." ... People are already using this economic slowdown to retool and reorient economies. ... People are realizing we need more than incremental changes — and we're seeing the first stirrings of growth in smarter, more efficient, more responsible ways.

Some of the retooling and reorienting of economies can be seen in how Americans from all classes are re-thinking their consumption patterns and saving more. Nationwide, individual savings accounts are increasing, and many of the Depression-era savings and re-use habits are re-emerging. Each day, news items feature the small details of these changes in habits, from curtailing outlandish spending habits to shopping in consignment stores and attending clothing swap events (Richtel 2009).

The throwaway, disposable culture that flourished with 20th century landfill practices is shifting to a more conservation- and reuse-based approach. This is a prime time to rethink the waste stream in general. This is the time to look at that pile of garbage and realize that one third of it is actually food; we don't need to pay to truck food across the country to throw it away. We can reject the systems that got us to this point and reorient our waste management practices to function in "smarter, more efficient, more responsible ways."

The Merits of Compost

Compost is the "biological process that transforms raw organic material into a nutrient-rich, biologically-stable soil additive suitable for plant and crop use" (Hutchinson 2008). During the process of compost, microbes decompose the organic matter in four basic stages. First, the raw material decomposes. Next, it humifies, creating a peaty mixture. Then the material stabilizes, as nutrients are adapted in microorganisms. During mineralization, the final phase, the nutrients are released from the compost and into the earth once again. Microbial activity generates heat, which—at between 130 and 160 degrees Fahrenheit—kills any pathogens after three days. As active composting slows during the curing process of several weeks, temperatures slowly drop to 100 degrees Fahrenheit and then to ambient air temperature (Dougherty 1999, 1).

Compost during curing phase. *Source: Author. All photos by author unless otherwise noted.*

While compost is a simple organic process, it's important to control for some of the negative outcomes that can occur. For example, compost with too much nitrogen (found in food waste and other

sources) and too little carbon (woodsy waste like twigs and leaves) will produce ammonia, a foul-smelling gas. Compost with too many wet ingredients (tomatoes, chicken manure, etc) won't get enough oxygen for the microbes to function properly. Further considerations are the pH balance, particle size, and temperature in the compost pile.

Beyond the negative issues, such as odor and vermin attraction, is the question of the usefulness of the compost itself. Depending on the intended plan for the finished compost, the compost inputs and quality can vary substantially. The carbon-based "woody" elements, such as leaves and wood chips, need to balance with the nitrogen-heavy "greens" to create an ideal balance. Certain feedstocks will produce certain types of compost most suitable for specific applications. If one is concerned with creating well-balanced compost for use in agriculture, some training can be necessary to determine the compost's quality and maturity. Numerous compost test kits are available, so that practitioners can check the progress of their compost.

The process of compost can happen on a variety of scales, several of which will be analyzed in this thesis. On the small end are backyard compost bins at private residences, where individuals place their kitchen and yard waste in bins, and the compost occurs without monitoring and little or no quality control. Moving up, some community gardeners gather their garden waste and compost it within the garden itself. At the larger neighborhood or municipal scale, compost management can be decentralized or centralized. Most cities that compost as a waste management strategy use a centralized method, where the organic waste is managed like other garbage and recycling. Within the centralized mode there are two additional approaches—source-separated and non-source separated (NSS).

Shared compost bins at Gardens of Union in Park Slope, Brooklyn. *Source: FlatbushGardener on Flickr*

Overall, compost is better than treating organic waste just like other garbage for two main reasons. First, when organic material biodegrades anaerobically, as it does in the typical landfill, it produces methane—a greenhouse gas that is 23 times more potent than carbon. Second, when organic material is discarded, the nutrients it contains are removed from the cycles of nature, never to be returned. It truly goes to waste. By contrast, reclassifying organic "waste" as "food" will open a greater potential for nutrient recovery and management.


Municipal compost facility, Hawk Ridge, Maine

Furthermore, organic material is particularly dense, wet, and heavy to transport, which makes it more expensive. Moreover, transporting organics over long distances produces additional undesirable effects. A staggering number of garbage trucks travel on U.S. roads and highways. According to a 2003 study by INFORM, there are an estimated 136,000 refuse collection trucks, 12,000 trucks that transfer waste to landfills, and 31,000 trucks used specifically for recycling. The entire sector is more than twice the size of the national municipal transit bus sector. Because of the nature of garbage routes, one garbage truck logs an average of 25,000 miles per year; the industry total is 3.4 billion miles per year. Garbage trucks also use more fuel than any other vehicle. Any attempts at fuel-efficiency are slowed by its necessary functions: constantly stopping and starting, and idling for over 60 percent of operating time. They also generate high noise levels.

In sum, composting is a viable alternative for managing organic waste that can create a valuable amenity, return nutrients to the food supply chain, and reduce the production of greenhouse gases. Local composting is even better, because it can alleviate the noisy, expensive trucking of garbage by 30 percent, if handled properly. Compost also has uses beyond gardening improvement, from filtering storm water to cleaning toxic soils.

Compost Successes in Other Cities

Elsewhere in North America, local governments have taken the lead on compost. They recognize the waste management potentials in diverting large percentages of organic waste from landfills; they are also responding to public concern for this issue. Nationwide, compost rates have increased fivefold since 1990. By 2006, the Environmental Protection Agency (EPA) reported that the United States was composting 20.8 million tons of material in 2006, which represents 8.2 percent of the 251 million tons of municipal solid waste generated that year. In 2006, there were 3,470 compost programs in operation, an increase of 7.5 percent since 2002 (EPA 2006, 9).

The City of Portland, Oregon has set a goal of 75 percent recycling by 2015. As of 2007, the City's recycling rate is 61 percent and refers to all recyclable material, not just organics (City of Portland, 2007). Portland provides a suite of financial incentives, from matching grants to tax credits, to encourage participation. Portland's waste hauling trucks collect organic materials from commercial clients in big green bins on specific food-waste-only runs along the route. Clients sort the food into free bins provided by the City of Portland. Food waste is then taken to a transfer station in Northwest Portland, where it is inspected and re-loaded into trailers in 25-ton loads and taken to the Cedar Grove Composting facility in Maple Valley, Washington, which is approximately 130 miles north.[4] Maple Valley is currently the closest facility that handles food waste. Portland has been searching for a site for a local compost facility, but has not found an appropriate location. While the City searches for a new 26-acre site, however, much of the organic material is being collected and sent to landfills (Learn 2008).

The strength of Portland's curbside pickup system is that it captures and composts a significant amount of organic waste, and also promotes widespread participation. Based on the figures from Portland, we know that businesses are separating their food waste, which is a valuable practice. But the process introduces an additional

4 Source: googlemaps.com. Most of the 130 miles are traveled on Interstate-5, the main north-south highway that runs from the Canadian border to San Diego. I-5 is central to many of the traffic problems in the Pacific Northwest.

set of trucks, traveling great distances, which create traffic, pollution, noise and carbon emissions.

Toronto sanitation worker emptying a green bin into a two-compartment truck. *Source: City of Toronto*

Toronto is another city whose municipal recycling program boasts a high rate of organics diversion. Their program demonstrates that a high diversion rate also requires adequate facilities to manage the rapid increase in demand for centralized compost processing. In 2007, Toronto diverted a total of 93,009 metric tons of residential waste from landfills through the combination of their Green Bin, leaf/yard waste and Christmas trees, backyard composting, and grass-cycling programs. Since the founding of its Green Bin program in 2002, Toronto has set the ambitious goal of diverting 70 percent of all waste by 2010 (City of Toronto 2009). Since the closure of the city-owned local landfill, the city has been shipping its waste to a landfill in Michigan, which has increased the City's waste disposal costs by 300 perecent (City of Toronto 2009). The financial incentive to compost is evident, and the city has responded with a comprehensive plan to manage waste locally and create compost. The city's approach includes a multi-faceted outreach and education campaign, a menu of different colored bins and arrangements to manage the waste flows, and innovative retrofits such as installing a second compartment in the garbage trucks for compostables (City of Toronto, 2009). As a result of these City-led programs, 510,000 households participated in 2007.

The demand for compost facilities is outpacing Toronto's supply, however. Between 2006 and 2007, the amount of organic waste collected increased by 30 percent, forcing some municipalities to truck their food waste to incineration facilities in New York State, according to the March, 2009 article in the *Toronto Star*.

> The green bin program has grown so fast that it has outstripped the ability of municipalities to process the organics locally, creating a new carbon foot-

> print since the material is trucked to facilities hundreds of kilometers away. ... The vast popularity of organic recycling has placed cities in a vulnerable position. When a facility shuts down, city managers need backup plans because excess rotting food cannot be stored in warehouses (Welsh 2009).

The current challenge is to manage the daily flow of organic materials; as soon as the facilities are built or incorporated that can handle the flow, the system will reach a new equilibrium. At present, one new facility is under construction and a second older facility is being reconstructed; each will handle 55,000 metric tons per year (City of Toronto 2009).

San Francisco has set a goal of 75 percent waste diversion by the year 2010, which surpasses California's state law of 50 percent recycling. The City's three-cart system (recyclables, organics, and trash) is similar to Portland's, with a series of transfer stations and compost facility, Jepson Organics, located 55 miles west of San Francisco. Currently, San Francisco diverts 70 percent of its waste from landfills. San Francisco's ambitious diversion program is strongly backed by its mayor, who proposed the imposition of fines for those found not separating their organics. (Last fall, the *San Francisco Chronicle* reported that the proposed fine for failing to separate organics was reduced from $1000 to $100.) San Francisco demonstrates that when the political will exists to enact organics diversion, it happens quickly and smoothly. Inventive programs like "from food to wine" deliver compost from San Francisco restaurant scraps to California's many wineries (Mullane 2006), demonstrating how compost programs can be designed to benefit local businesses. And by imposing fines on those who do not comply, San Francisco creates a powerful incentive to participate, thereby increasing its overall diversion rate, fast.

The experiences of Portland, Toronto, and San Francisco suggest several lessons for New York City. All three cities have adopted curbside pickup systems, which have facilitated speedy shifts in public understanding about managing organic waste. These are efficient programs when it comes to mandating a policy and guaranteeing that the waste is separated and handled properly. In addition, the high volume of organic material that is diverted from the waste stream as a result of extensive participation in curbside system appears to outweigh the negative impacts imposed by trucking the material across great distances. Significant hurdles have arisen, however, in managing the flows of waste; siting large composting facilities near enough to the city to make the projects economically feasible while not creating additional

pollution; and minimizing noise, runoff, and other problems caused by trucking.

Now that a marginal, backyard practice has been placed at the center of the waste management agenda, the next step is finding a way to make it work. In findings based on my research in New York, I argue that a network of a smaller, more diffuse compost programs could address many of these concerns.

Compost in New York City

The New York City Department of Sanitation (DSNY) has not taken the lead in managing organic wastes, and has funded efforts to improve its compost programs only intermittently. As a result, NYC is composting only a tiny fraction of its organic waste, trucking heavy waste to distant locations, and producing methane.

DSNY Transfer Station, Staten Island. *Source: Department of Sanitation*

New York City produces 50,000 tons of waste and recyclables each day. The Department of Sanitation describes its challenge this way: "The system necessary to handle this volume of waste is vast and complex, involving a network of City employees, garages and specialized vehicles, as well as a far-flung array of private haulers, transfer stations and disposal companies" (New York City Department of Sanitation 2006, ES-1). In 1990 the City added compost to its recycling program with leaf waste pickup; as of their 2001 report, they City diverted 47,000 tons of organic material per year through a combination of leaf and yard waste compost and mulching, and its in-vessel compost system on Riker's Island.

In 2001, the New York City Department of Sanitation (DSNY) released a report, "Composting in New York City: A Complete Program History," which outlined several of their test projects that had been carried out over the years and highlighted

several compost programs taking place within other city institutions. Its Introduction states:

> Composting represents an important option as the City looks to increase its recycling rate in the face of the closure of its last active landfill and the mounting cost of exporting garbage. What is the best way to extract and compost this biodegradable component from the City's waste stream? Any answer to this question needs to take into account NYC's dense urban environment, where space is limited and valuable, and compost facilities are difficult to site.

Having acknowledged the importance of compost as a method of waste disposal, DSNY carried out five pilot projects to test different methods of organic waste pickup, compost, public participation, facility siting, and other issues. The department divided the pilot programs into two types: "centralized composting," which included various pickup and siting issues, and "decentralized composting" which reviews smaller programs in a handful of colleges, hospitals, Riker's Island, as well as their Compost Project Outreach and Educational Program, which encourages residential backyard composting.

The report reached several conclusions. For successful decentralized institutional composting, the report strongly suggests that institutions employ "in-vessel"[5] composting to manage larger flows of waste, deter vermin, and filter odors. However, "several, key operational obstacles have prevented this type of composting from taking off in the City" (DSNY 2001, 65). These obstacles include costs of labor to manage the compost, committed program leadership, and ample space for processing compost.

For DSNY's approach to decentralized compost projects, cost remains the chief problem:

> Operational costs are also high relative to current waste-hauling costs, unless labor can be allocated from other tasks at no additional cost.[6] Consequently, unless the cost of installing and operating these systems decreases dramatically, the Department does not anticipate making significant future investments for on-site, in-vessel composting at institutions (DSNY 2001, 66).

5 "In-vessel" refers to the compost processes that take place in an enclosed container or facility that can control for odors. In-vessel compost takes place at many scales from large facilities to containers about the size of a picnic table.

6 The report states that the economic success of the compost program on Riker's Island is largely attributed to the free labor provided by the inmates. (DSNY 2001, 38)

Thus, in-vessel compost is clearly the superior way to handle decentralized compost management. And yet, the DSNY's approach suggests that is far too expensive.

As for municipal-scale composting, the report concludes that the optimal solution for composting all of NYC's organic waste would be to construct "several centralized facilities sited and built in, or near, New York City." Because of NYC's unique density, the facilities would need to be "fully enclosed, and employ state-of-the-art odor control" (DSNY 2001, 66). Relatedly, the report addresses how to manage organic waste pickup and source separation. Much of this discussion centers on the use of garbage trucks, and how to maximize the cost (labor, fuel) associated with each truck's route. Their pilot projects showed that a separate pickup route was too costly to maintain, because "it is very difficult to achieve an efficient truck route when collecting only organic material."

Likewise, the department deemed the public education efforts that went alongside the pilots as unsuccessful, because "residents simply did not place enough organic material at the curb to justify the cost, no to mention the environmental impact, of putting another truck on the collection route" (DSNY 2001, 67). Thus, the report concludes with a recommendation that the DSNY pursue a pilot non-source-separated (NSS) facility that would collect all waste, and separate the organics from the other garbage within the facility. The Department's test of this method, carried out with one week of NYC waste at a facility in Massachusetts, produced medium-quality compost. The report concludes by saying that NSS composting "appears to be the most practical, economical way to recycle the City's organic waste."

DSNY's follow-up report, "New York City MSW Composting Report: Summary of Research Project and Conceptual Pilot Facility Design," issued in January 2004, proposes a full-scale scenario for a "theoretical pilot facility in New York City" (DSNY 2004, 15). The benefit to MSW composting, in which all of the garbage is taken to a central facility where the organic materials are extracted using machines, is that it is much more efficient in capturing organic waste than asking citizens and businesses to separate before pickup. This allows DSNY to "capitalize on the collection efficiencies it already achieves for refuse, without the monetary and environmental burden of sending out more collection vehicles" (DSNY 2004, 19). The Report outlines additional spatial and design features of the theoretical pilot facility, expressing that it should: capture nearly 100 percent of the degradable fraction

of the waste stream; build upon existing waste-collection efficiencies; require no additional public education (residents would not change their trash generating or sorting behaviors in any way); potentially recover 70 percent of the waste stream for recycling; and pay an equivalent cost-per-ton compared to current disposal options (DSNY 2004, 24).

In short, the report suggests that DSNY maintain its existing functional model in several key ways. The model requires no additional labor or labor negotiations, trucking routes remain intact, public education can be ignored, and costs remain approximately the same. They recommend a way to compost while making no substantial changes in their organization. One wouldn't necessarily expect a huge city agency to suggest an overhaul of its own systems; however, their findings suggest a goal—one very large central facility—that will be nearly impossible for the organization to achieve. So while DSNY dithers on this topic, organic materials continue being sent to landfills. The DSNY's "Comprehensive Solid Waste Management Plan," issued in September 2006, takes up 2004's theoretical pilot facility in saying: "While this study concluded that no one technology is ready to handle the entirety of the City's waste stream in the near term, a Phase II investigation is underway and appropriate pilot projects are being identified" (DSNY 2006, ES-12). This Report also suggests assigning a "Composting Facility Siting Task Force."

PlaNYC 2030, Mayor Bloomberg's long-term sustainability plan, does not address waste management. City employees with whom I inquired attributed this omission to the fact that the City's comprehensive waste management report had just been issued only six months prior. Thus, there was no need to reiterate its aims. However, other recent plans were included in PlaNYC 2030; the exclusion of solid waste has drawn criticism.[7]

What can be gleaned from a decade of pilot projects, studies and reports with no action? DSNY leadership appears hesitant to address composting, whether for political, economic, labor management, or other reasons. In a city like New York,

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7 Cohen, Steve. "A Year in the Life of PlaNYC 2030: Performance, Promise, and Limits." The New York Observer, April 25, 2008. The article discusses a report issued by the City, assessing its own performance under PlaNYC 2030, and states: "Of all the areas outlined in our 2007 Sustainability Agenda, the Bloomberg administration's performance is weakest in the field of solid waste. The [New York] League [of Conservation Voters]' criticized the mayor for not supporting broad enough recycling measures..."

where "green" and sustainability are such current and pressing issues, compost should not be ignored. Other big cities have found ways to make it work.

DSNY does, however, support educational programs for backyard compost through small branches of its New York City Compost Project outreach effort in each of New York's five boroughs. These partnerships work within the botanical gardens. The Compost Project "develops and conducts many innovative programs to encourage residential and institutional composting (NYC Compost Project 2009)." Each borough office has one to three staff members who carry out public education demonstrations, teach backyard and worm-based composting, and train people to become master composters. The program was launched in 1993. Funding was cut following September 11, 2001, and restored in 2004. From 1994-1997, the NYC Compost Project's five branches hosted 284 classes, workshops, and presentations, reaching approximately 15,000 people.[8] In addition, they gave 200 workshops in NYC schools, reaching approximately 6000 students (DSNY 2001, 57).

The Department of Sanitation has studied and practiced various options for how compost could be handled in New York City, and a handful of dispersed backyard compost field offices are a useful strategy and approach. But overall the Department's slow approach has left a void in addressing the issue of organic waste.

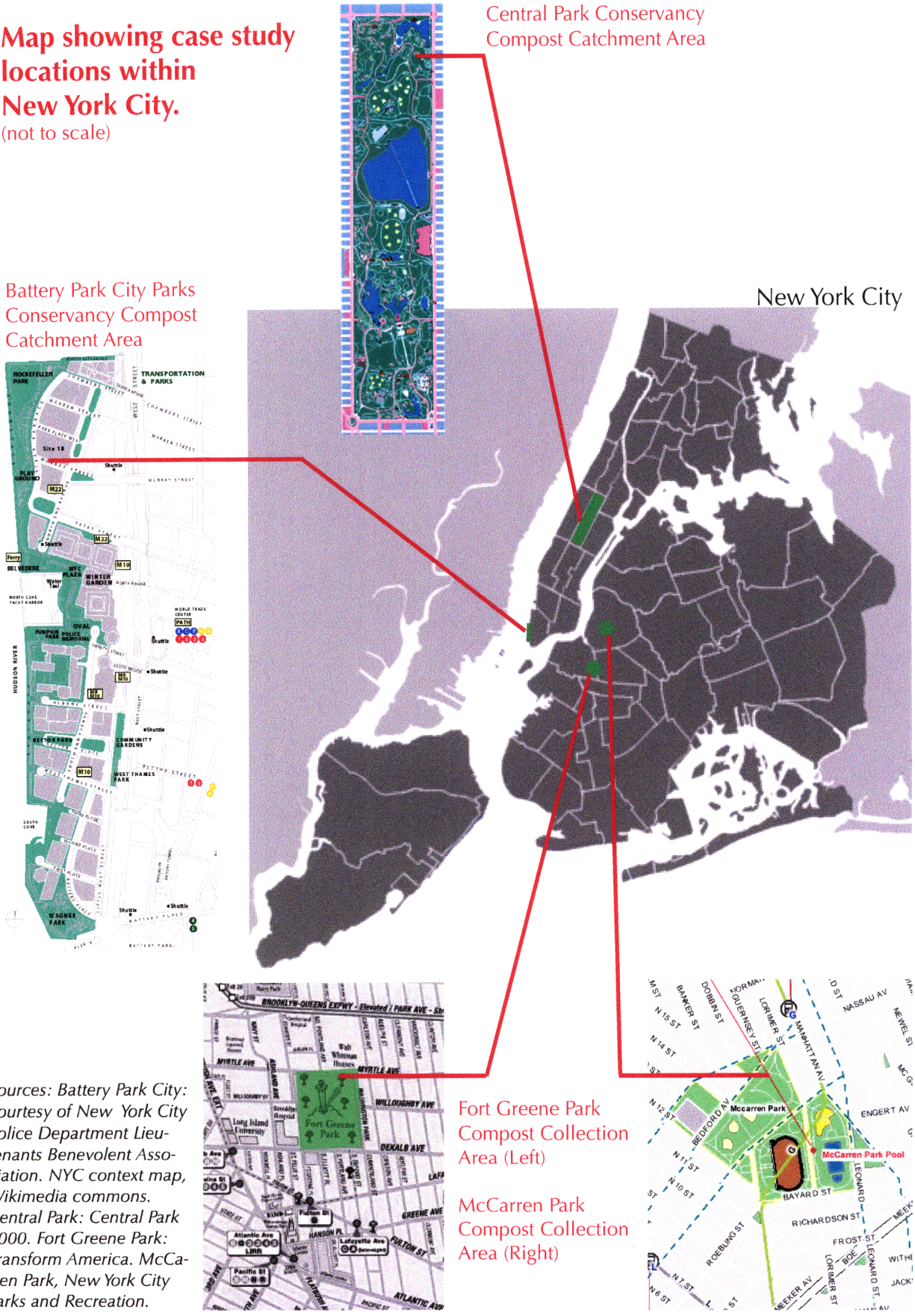
Small-Scale Composting Projects in New York

To fill this void, several alternative approaches are dealing effectively with compost within New York City, yet operating outside of existing City-managed structures. These projects are examples of what New York could learn if it chose to build on the spirit of its citizens in revaluing how waste is managed in NYC. As a group, they suggest a future for organic waste management that would greatly benefit New York City and also provide a useful product for food production, ecological maintenance, brownfield remediation, storm water filtration, construction fill, and other uses.

The four case studies work in pairs. The first two are locally organized projects wherein neighbors compost their food waste together at community gardens. These cases point to the positive community-building aspects of shared small-scale compost, and the very small physical space that is actually needed for compost. The

8 These are the most recent figures currently available in published sources.

Map showing case study locations within New York City.
(not to scale)



Sources: Battery Park City: courtesy of New York City Police Department Lieutenants Benevolent Association. NYC context map, Wikimedia commons. Central Park: Central Park 2000. Fort Greene Park: Transform America. McCarren Park, New York City Parks and Recreation.

second pair are park management projects designed to make a useful product for park use; one of these incorporates neighborhood food waste. These are larger in scale but more limited in their coordination, and provide examples of compost production as a cost-saving practice. I compared the four programs based on a general set of criteria:

- Effectiveness of waste reduction
- Community engagement possibilities
- Transportation impacts
- Financial benefits and constraints
- Quality of finished compost

Fort Greene

In Brooklyn's Fort Greene, several local community gardens are collaborating to collect the neighborhood's organic waste. They have the dedicated volunteer base, space to compost, and gardening demand for compost to make the project successful. Fort Greene is an historic Brooklyn neighborhood; Fort Greene Park (then Washington Park) was Brooklyn's first park, built in 1847. Its proximity to downtown Brooklyn, many subways to Manhattan, historic brick brownstones, and comparative affordability make this an appealing neighborhood for young families.

Drop-off site in Fort Greene Park.

On Saturdays, volunteers place collector bins at the GreenMarket, a city-run farmer's market operated in Fort Greene Park. From 9:00 a.m. to 3:00 p.m., neighbors drop their organic waste in the bins provided. Several times throughout the day, volunteers from a local community garden pick up the waste. They transport the waste via cargo tricycle to their community garden, where volunteers compost the food waste ("greens") with other organic material ("browns") produced in the garden. Three gardens participate: Hollenback, Greene Acres, and Clinton Hill, with Hollenbeck picking up the waste twice each month. Hollenbeck is the biggest garden of the three and has more space and volunteers for the compost effort than

the others. Organizers estimate that approximately 1,000 pounds of organic waste is dropped off at Fort Greene Park each week, representing approximately 400 people (250 households). Each garden also has an additional collection area sited at their garden for close-by neighbors to drop food waste.

Volunteers bringing the organic waste to Green Acres Community Garden via cargo trike.

Fort Greene's strongest asset, according to its organizers, is the group of committed volunteers who make it happen. One is the "recipe guy" who can access a wide variety of materials to combine with the food waste to produce higher-quality compost. Another is the "community organizer" who manages all of the people involved. Still other volunteers excel at building the compost bins, churning compost, and doing all the weekly work to make the system operate smoothly.

Drop-off site at Greene Acres.

Based on my conversations with some of these volunteers, it was clear that the volunteers hold one another in high regard, and are proud of the system they have created. Their dedication to the project seems bolstered by the pleasure they get from working together. The volunteers emphasize the enormous sense of responsibility, and take it seriously when its "their turn" to pick up the waste. Seth Orman, a volunteer from Green Acres Community Garden said, "you have to be there, you have to manage it, it's a real responsibility. … We've never said, "no, you can't bring your food", the site is always staffed, 52 weeks per year. People really depend on it."

The Fort Greene program is a strong example of the possibilities for small-scale compost for a variety of reasons. The first is that it is a volunteer-run effort with almost no budget. Volunteers do all of the organizing, labor, compost management and coordinating of the weeks and projects. Fort Greene has no negative transportation impacts; the waste is moved on cargo tricycles, which removes the concerns about emissions, traffic and noise associated with truck transport. The project keeps the organic waste within several blocks of where it was generated. Possibly most importantly, the compost is used to produce food in urban community gardens.


High school volunteers screen the compost

Several positive externalities exist as well: neighbors are meeting one another in the context of their compost work, creating a mutually beneficial network of support around their community gardens, strengthening community ties and contributing to the long-term viability of the garden. These community garden-based links contribute to safer, healthier neighborhoods (Twiss et al. 2003).

For all of its strengths, a few key shortcomings exist in this system. As it currently operates, this network diverts only a tiny percentage of organics from the waste stream of this densely populated neighborhood. Organizers estimate they receive 1000 pounds per week, which is low when compared to neighborhood-wide, Brooklyn-wide or citywide totals of waste produced each week. Even that small amount of organics diversion takes the dedicated volunteer time of a few dozen people. When I visited in February, compost volunteers expressed concern that the program was approaching peak capacity for accepting food waste. The compost bins at the three gardens in the Fort Greene system were nearly full, and this came after winter. Participation will only increase in spring and summer as people eat more fruits and vegetables and spend more time out in their parks and gardens, which only means more food waste and further need to manage it.

Furthermore, the system is so delicately balanced that if even one community garden pulled out of the agreement, it could put too much pressure on the other gardens, causing the whole system to collapse. As of March 2009, volunteers were organizing a community meeting "to discuss the out-of-control popularity of the composting project" (Keegan 2009) and how to manage the influx of food waste within the existing scale of their system. Clearly citizen participation is quite high. At what point is it unreasonable to rely on volunteer labor to manage a significant portion of the waste stream in a major city?


Volunteers closing the bins at the end of a maintenance day.

North Brooklyn Compost Project in McCarren Park

Moving three miles north to McCarren Park in the Greenpoint neighborhood, the North Brooklyn Compost Project (NBCP) composts food waste on a site adjacent to a dog run, and next to a CSA pickup. Like many parts of Brooklyn, its proximity to transit and comparative affordability have made it appealing. Greenpoint is a historically Polish neighborhood and has in recent years attracted many young artists and musicians. McCarren Park is one of the few open spaces in the area, and its enormous Robert Moses-era public swimming pool sat empty and unused for decades. For a few years, music and sports events were organized to take place inside the empty pool; these became legendary events for young artists in New York.

Handmade sign at the entrance to the North Brooklyn Compost Project.

Smaller than Fort Greene's, the North Brooklyn Compost Project serves about 130 members each week. On Saturday mornings during the compost season, which runs from May to October, members drop their food waste at the site, which is staffed by NBCP volunteers. NBCP composts the waste on site, which means there is no transportation of the food waste

until it has become compost. Finished compost is given back to neighbors, or used in McCarren Park or in the adjacent community garden. Volunteers sign up for hourly shifts at the project, to monitor the incoming food waste and answer any questions. They prep the compost for the bins and leave it there to compost in the park. A few times a week one of the volunteers or the program's founder comes by to turn the compost and check to be sure that everything is fine (North Brooklyn Compost Project 2008).


NBCP compost tumblers in McCarren Park.

This project was founded in 2004 by Kate Zidar, who was working at the Lower East Side Ecology Center and began composting in her local community garden, adjacent to the current site of the compost project. As participation started to increase, the project moved from the garden to the next section of the park. Now that the program has been running for a few years, members are working on improvements to the area, including finding funds for a new gate to secure the space. In Spring 2009, they began using compost in the tree pits of the nearby street trees, outside the park. Project organizers hope that these stewardship efforts will demonstrate that they are good neighbors (Zidar 2009).

At the close of last season, the NBCP organized workshops to teach compost members to compost with worms at home as part of a larger, longer-term strategy to increase composting all around. Kate Zidar sees the long-term strategy in two ways. The North Brooklyn Compost Project is a community-building and social network that gets people excited about separating their food waste and turning it into compost. After developing that practice for a season or two, the NBCP encourages its membership to adopt at-home worm composting. When the first "wave" of compost drop-off participants has transitioned to worm compost, their attrition creates space for new compost project members to contribute food waste. Her approach

suggests that the low number of participants at any given time is because this is actually a changing roster of people.


Volunteers prep the site for the spring opening.

North Brooklyn Compost project participants are reducing their total waste volume by only a small percentage of the waste stream for the borough of Brooklyn, so their achievement in that area is not particularly significant. However, the real strength of this program is the community spirit that has been empowered by the shared practice of composting. Compost members are meeting each other, socializing and forming community ties in the process. This was apparent when I visited the site on a spring day when neighbors were working together to "screen" the compost. This project has no negative transportation impacts, and makes its few capital improvements (purchasing a better gate, etc) from monies raised in small fundraising events.

The current system lacks a mechanism in place to ensure the quality of the finished compost. A testing mechanism could ensure that the compost is of optimal quality for use in the community garden. While compost can look and smell terrific after it has cured, it can be harmful to plants if its nutrient-balance is off.

Both of these networks are models of "bottom-up" planning. Like many efforts that successfully organize communities, this is volunteer-led and functions on a shoestring budget. They require very little by way of "membership" and have a low administrative network that keeps it from becoming unwieldy, large, and cumbersome.

Central Park Conservancy

In contrast to these community-oriented systems, two Parks conservancy organizations operate slightly larger compost programs on public land. The Central Park Conservancy has been composting leaves, tree branches, grass cuttings and other park-maintenance waste within the park since 1987 (Central Park Conservancy 2009). Their compost area is located on the east side of Central Park, near Fifth Avenue at about 105th Street, just south of the Harlem Meer. Most of the organic

material that is generated within the park is composted or processed into mulch within the park, and used within the park. Park Conservancy staff has also given compost to local community gardens or other organizations that work with plants. Working about 12 hours per week during the spring, summer and fall, Park staff form the organic material into 12-15′ high windrows and use contracted three-yard front loaders and labor to turn the piles approximately twice each year. Central Park produces approximately 3,000 cubic yards of compost each year.

Panorama showing compost in Central Park.

According to Matthew Brown, Central Park Conservancy Soils Scientist, the Conservancy began composting because they wanted to save money on waste hauling costs. They realized it makes more sense to save money on waste hauling, and also save money by not buying packaged mulch. What began as a cost-saving step is now also an environmental approach.

The strengths of this approach are that they are avoiding trucking waste out of the Park; they make free mulch, and create a soil amendment that they use throughout the entire Park. It is, for these purposes, a closed system. Matthew Brown said that restaurants often call him to see about dropping their organic waste at his compost site, but he refuses it, because he does not want the food waste to attract rats. He also does not have the staffing capacity to manage an additional aspect of their compost pile.

Few shortcomings exist in this program. Current staffing models suggest that it would be difficult to expand the program to accommodate other inputs. But because space is available in this area of the park, the site is distant from residences, and the operation has been free of complaints for so long, it seems feasible that the project could expand, should the will exist among Park staff. Central Park tests its compost for quality. Likewise the transportation impacts are quite low, as they are

only moving the organic materials within Central Park. At present, their compost project lacks a community engagement element, but perhaps with a staffing increase some types of community involvement could be made possible.

Battery Park City Parks Conservancy

In Battery Park City, the Parks Conservancy also composts all of the waste that is generated within the Park. Since launching the compost project in 1989, the compost program has been a key part of the BPC Parks Conservancy's organic gardening program. Staff members wanted a high-quality compost to use in the Parks, and at the time few options existed. Over the past twenty years the project has been located in several locations throughout the site, as Battery Park City has been built. Originally Battery Park City had numerous vacant lots; finding a space to compost was fairly easy. As the development has continued, however, open space has become increasingly rare. In March 2009, the compost operation existed on three sites throughout Battery Park City. Later this year, the project will move indoors to a new building, where all of the park maintenance equipment and compost facilities will be located together indoors. The new Conservancy office space will also include a laboratory for testing compost and enabling the project to further expand its research in compost science.

BPCPC staff members with organic waste from the Parks.

Indoor site of new BPCPC compost facility.

In addition to the park maintenance waste, such as leaves and branches, Battery Park City collects food waste from local businesses: two supermarkets and a handful of local delis and restaurants. Every day, two staff members make a small tour of Battery Park City to collect food waste from the businesses, and bring

it in a small vehicle similar to a golf cart to one of the two in-vessel composters. After three days in the extra-hot in-vessel system, the material has decomposed sufficiently so that it is no longer appealing to rats. From there, the material is emptied into a second in-vessel system where it composts for three weeks. After that, it is moved to a third location where it cures. The entire BPC Parks staff participates in the compost project to some degree, and the daily staffing plan includes the two people who gather the food waste, and one person performs daily checks for temperature of the in-vessel systems. Battery Park City then uses all of the compost that is produced (about 100 cubic yards) within the Parks and in the tree pits that grow along the street network in Battery Park City.

Top: Battery-powered vehicle for picking up organics from local suppliers. Center and bottom: In-vessel composters at BPCPC site.

For Battery Park City, the quality of the compost is of highest importance. It was for this reason, says Director of Horticulture Eric T. Fleisher, that they started gathering nitrogen-rich food waste from the local businesses and using it within the compost (Fleisher 2009). From there, the impact on the local waste stream was an added benefit. He also stressed that in typical ornamental garden maintenance strategies, "90 percent of the valuable nutrients are removed from the landscape and don't make their way back" because they are removed from the local context and trucked to distant landfills. Local compost programs keep the nutrients within the landscape.

There seem to be few shortcomings in this system. Its proximity to highly dense upscale housing, and the Ritz-Carlton

Hotel, might suggest contention among the neighbors. BPCPC staff claim there has been no complaint, even from the very nearby Ritz, since the project was formalized. BPCPC has also built an impressive network of feedstock providers for its quality compost, while building a constituency of Battery Park City businesses that separate their excess organic materials. One business owner said she was working to increase participation among her local business colleagues, especially as a way to save on waste hauling costs.

Future plans for BPCPC include collaborating with a new school that is currently under construction across the street from one of the existing in-vessel composters. Students could participate in compost, possibly donate food waste from the school, and could participate in a demonstration project for helping others to learn about compost.

As far as overall waste reduction, the BPCPC model should be replicated. Its dedicated staff has developed a quality system that has adapted over time to counteract the negative aspects of compost, while creating a top-quality product. Meanwhile they are keeping their organic nutrients present in the soils, with no transportation impacts.

Lessons From Small-Scale Composting Experiments

Looking at these small, non-governmental compost programs in NYC, several strengths are apparent. These models were developed in response to their context, by local citizens and staff members, and as a response to specific needs of that group and locality. A few highly committed individuals lead the programs. With the exception of Central Park, where the program has lasted through one staff turnover, the other programs remain within the purview of the original founding staff or volunteers. Therefore we have no proof of their staying power across changes in leadership. All four programs operate with little or no transportation impacts; waste is processed into compost very near where it was generated, and compost is used nearby.

Aside from these common features, the programs differ in their philosophical approach: some emphasize waste management, while others stress compost production. Some emphasize community-building while others do not. They differ in their staffing models and budgets, from volunteer to appropriately compensated profes-

sional soil scientists and horticulturists. But they all demonstrate New York's capacity to separate waste and process compost in a dispersed fashion, within the city limits. The following table compares the programs.

	Fort Greene	North Brooklyn Compost Project	Central Park Conservancy	Battery Park City Parks Conservancy
Quality of compost	Not tested	Not tested	High	High
Effectiveness of waste reduction	Minimal	Minimal	High; waste remains within park footprint	High; waste remains within park footprint
Community engagement	Yes - residents	Yes - residents	None	Some - businesses
Transportation impacts	None	None	None	None
Compost inputs	Kitchen waste	Kitchen waste	Leaf litter, branches, park waste	Leaf litter, branches, park waste. Food waste from neighborhood
Cost & Benefits	No budget; Yields free compost. Used in community gardens	No budget; yields free compost. Used in multiple locations	Small budget. Decreased waste hauling fees; yields free compost	Comparatively high budget. Decreased waste hauling fees; yields free compost
Compost end use	On site at gardens	Given away to project members and used in nearby street tree pits	On site in Park	On site in Parks and nearby street trees

Recommendations for New York City

In the United States in the past hundred years, management of waste has shifted from private, mostly women's hands, to an elaborate network of waste haulers and landfill operators spread across great distances. In this transition, organic materials that had been previously fed to animals or composted, were thrown into landfills. Viewed from any angle, this is a negative outcome. Transferring heavy, dense material is expensive, whether it is trucked or shipped by rail. Disposing the material into landfills creates methane, which contributes to climate change. When organic material is landfilled, those nutrients are permanently deleted from organic life cycles. In the 6.4 years since DSNY published its report recommending the "theo-

retical pilot facility," approximately 39 tons or organic material has been sent to landfills.[9] That means 9.7 million tons of nutrient-rich compost material was never processed and instead produces methane in a landfill.[10]

As research has proven the value of diverting organics from the municipal solid waste stream, and public support for this practice has increased, some municipalities have adopted large-scale organic waste programs. Even though these programs tend to involve a lot of trucking, they have made concerted efforts to address the problem. Mayors like San Francisco's Gavin Newsom have made major policy changes based on findings related to organic waste management. As a result, we know that it is possible to adapt a system to accommodate organics composting.

New York's long-term planning strategy, as spelled out in PlaNYC 2030, emphasizes improving and creating parks, cleaning up and developing brownfields, and preparing the city for a significant population increase in the coming decades. New York will need to manage all of its systems—waste, water, transportation and others—to handle these changes. This is the right time for New York to take a pro-active stance with bold and creative thinking about managing its waste, especially its organics.

New Yorkers themselves are taking creative steps in this direction. They have invented and managed small-scale compost programs, without support from the city. Instead they operate on small budgets with volunteer organizers or few dedicated staff. A successful compost program requires five elements:

- A committed person or team of individuals who have the authority and dedication to manage the program
- Appropriate or adaptable physical space for compost collection, compost-in-process, curing compost, and finished compost, even if this is very small
- Adequate local supplies of compost feed stocks (with appropriate balances of carbon and nitrogen)
- Local use for the compost that is produced
- Trained, committed staff who can manage the compost on a regular basis

When these variables are in place, a compost program can be launched.

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9 This figure is based on DSNY's statistic that 50,000 tons of waste is produced each day in NYC. If one third of that material were organic, then 6.4 years of not composting would place 38,933,333 tons of organic material in landfills.

10 Figure is based on the previous figure, divided by four. Organic material reduces to approximately ¼ its original volume during the compost process.

First Steps

We have a strong case for composting; the question is how to make it work in a big city. The answer is to build on existing capacities within the city: find what works, and replicate it. Then connect the dots. A widespread compost network would require a broad coalition of agencies and organizations.

Step One: Reframe the problem. Because this waste is actually food, it should be managed as food. Organic materials are an issue of natural resource management, not of waste management.

Step Two: Establish a city Compost Office. Rather than leave organics management to the Department of Sanitation, whose expertise is in landfills, responsibility for organic materials should be transferred to an agency that handles food. Many of the same networks that manage food can manage organic waste material: storage, transportation and other infrastructure. For materials management at the city level, I suggest one of the following:

- New York City Department of Environmental Coordination (city agency). The DEC handles environmental review for the city. I recommend this agency because they are new and nimble.
- New York City Council on the Environment (non-profit agency), which is subcontracted by New York City to manage the Greenmarkets. Because of their existing role in managing a network of food suppliers from the greater New York region, the Council is uniquely positioned to take on the management of an additional food-resource related effort.

Step Three: Once food has been reclassified as a resource, and a Compost Office has been established, the next step is to legally mandate the separation of "excess organic materials" from the waste stream. Following the lead of San Francisco, New York can implement fines for those private and public entities that don't separate waste.

The Compost Office

The Compost Office would "connect the dots" between food waste sources, compost facilities, and end uses for compost, emphasizing opportunities for small-scale local compost with minimal trucking. Beginning with the adoption of a network of small, local compost programs like McCarren Park's and Fort Greene's, the Compost Office would develop a menu of options for organics management. Moving up in

scale, the Compost Office can help entities to replicate small, multi-tiered systems, like the program at Battery Park City. The most successful element of that project is its use of a small number of in-vessel composters within local jurisdictions where they can process the organic waste immediately, removing its appeal to vermin. The Compost Office would connect the existing jurisdictions: business improvement districts, school districts and community boards.

Additionally, it makes sense for the Compost Office to manage the Compost Education and Outreach Project, currently part of DSNY. The important work of this successful program should be magnified and connected to existing City government projects, from working in schools through the Department of Education, and at home through the Housing Authority.

Likewise, the Compost Office could coordinate with New York City Department of Parks and Recreation. NYC Parks form the ideal network of dispersed sites for compost drop-off, processing, and use. The models of Battery Park City and Central Park demonstrate that park waste is ideally managed on site, and the Fort Greene and North Brooklyn projects demonstrate that citizens are willing to hand-carry their compost to their neighborhood park. All of these compost programs are small and take place on edges of parks, where they do not take away valuable recreational space; increasing the number of that type of compost would benefit neighbors and parks.

The Compost Office would manage the flows of compost, tracking where organic waste is produced and where compost is needed. It would find possibilities to further disperse compost operations while handling larger amounts of organic material. This office would also regulate end-uses of compost for development projects, Parks facilities, to ensure that the compost that is produced is also being used within the city.

Compost as Infrastructure Element

Greater volumes of local compost could accomplish many other tasks that would serve New York City's urban environment. PlaNYC 2030 emphasizes brownfield cleanups as a top priority in making more land available for development. This is a prime opportunity for the city to manage its municipal solid waste while cleaning up wasted land within the city. A 1997 EPA report, "Innovative Uses of Compost:

Bioremediation and Pollution Prevention," explains how compost can be used to mitigate toxic chemicals in soil. Compost was applied to soil at different sites with different contaminants: heavy metals, organic contaminants like herbicides, and VOCs (volatile organic compounds). The compost was combined with the contaminated soil in different ratios over several applications, and mixed with bulldozers or other machinery. In each case, "Compost bioremediation has proven effective in degrading or altering many types of contaminants, such as chlorinated and non-chlorinated hydrocarbons, wood-preserving chemicals, solvents, heavy metals, pesticides, petroleum products, and explosives" (EPA 1997). While this method would not be effective on every single contaminated site in New York, it would be a valuable approach at many existing sites. Using compost to digest toxic materials in soil saves money and works much faster than traditional remediation methods. Once the site has been restored to a pre-toxic condition, the compost will also facilitate the future growth of plants. Brownfield cleanup is a long-term effort for New York and will require many tons of compost. The new Compost Office would ensure an appropriate supply of compost to the sites undergoing remediation.

New York's many new park and construction projects would also benefit from local compost. On Spectacle Island in Boston Harbor, 65,000 cubic yards of compost was used to amend the topsoil for the creation of a new park. By using compost, the Spectacle Island project saved money and prevented the disruption of additional ecosystems by treating the existing soil with compost (NEBRA 2002). Spectacle Island is a mere 120-acre site. In New York, the Fresh Kills landfill-to-park conversion project on Staten Island is 2200 acres, and scheduled to be built over thirty years. The landfill mounds require 30 inches of soil atop the capping membrane—24 inches of fill soil and six inches of planting soil. The network of trails and other park amenities will require fill of various types

Soil is applied over plastic membranes on mounds at Fresh Kills Park.

as well. Currently, the Fresh Kills Park fill soil is being trucked from a site in New Jersey, adding to the overall cost and environmental impact of the project. Locally produced compost could save money, and help to build the constituency for the new Fresh Kills Park, as local neighbors see their organic waste making a constructive change to their community.

Throughout New York City, major parks and revitalization projects are under way. From Governor's Island in New York Harbor to the new Brooklyn Bridge Park, to the new development at Willets Point in Queens: all of these large scale projects will require different types of brownfield cleanup, fill, and soil amendment over the next few decades. The new Compost Office should connect these major projects with locally made compost.

Organics Removal at the Regional Scale

Even with these high-demand projects, however, the supply of organic material could outpace the demand. The city produces 50,000 tons of waste each day; 1/3 of that total is 16,650 tons of organic material. Certain times of year could produce more organics than New York would have capacity to process locally. Therefore, it is likely that some would need to be removed from New York City for composting. Excess organics can be transferred to farms in the greater New York region to restore them to the food cycle. San Francisco's "from food to wine" program is a good example of how food waste from the city can nurture the regional agricultural economy.

According to the New York State Department of Agriculture and Markets, New York has 580 organic farms, with over 64,000 acres in organic food production. Conventional farms cover over 7 million acres of farmland in New York State. Also, New York farmers keep 95,000 pigs as livestock. Farms could receive the organic waste and compost it for local use, or feed it to their animals. New Jersey and Pennsylvania, large farming states, are also connected to New York by extensive rail networks. Organic material from New York should find its way back to the farms.

This could work in a few different ways. Currently, farmers pay to keep a stall at New York City's 46 farmers' markets, called Greenmarkets. Farmers pay a fee to the Council on the Environment to keep a stall in the market. However, few incentives exist for the farmers to participate, beyond the narrow profit margin on local pro-

duce. They pay high costs to truck their product to the City and often lose staff to spend a day traveling to the city and selling food at the market. Roy Arezzo, of the Fort Greene compost program, suggests that the participating farmers could pick up the organic material dropped off by neighbors at the Greenmarket, fill their trucks at the end of the day, and drive back to their farm. They would compost the waste or feed it to livestock without adding additional trucks on the road. In some ways this idea could revive the hog farm model from the 20th century.

For high volumes of commercial organic materials, such as those produced in food-processing industries, the city can use existing rail and water-based transportation networks. New York's rail network extends for hundreds of miles to the north, south and west. Cars on these rail lines could be retrofitted to handle organic material backhaul to the hinterland. Outbound trains could take additional cars filled with organics to their destinations upstate and across Pennsylvania, Connecticut, and New Jersey. The waste could be delivered to local stations, or even subway stations, and transferred to the long-distance heavy rail network for processing elsewhere. This approach would require a network of transfer stations sited at or near existing rail corridors.

Likewise, New York's rivers could support an organics transportation system. A water-based system of organics materials removal could be housed on piers and barges along New York's waterways. Small transport vehicles like cargo trikes or small trucks could convey the material to the piers. From the piers, organics could be barged to hinterland locations for compost processing.

APPENDIX: A Note on Methodology

When choosing the scope of this study, I wanted to analyze different scales of compost projects in the same city. I was interested in New York City for the kinds trucking-free compost programs that exist there. New York's variety and density of neighborhoods and housing stock also present a challenge for composting that, if overcome, could easily be replicated in less-dense cities. The City's Department of Sanitation has carried out several pilot compost programs, a report on which was published in 2002, and provides the City's viewpoint on what methods are feasible and which are not.

My research into locally organized compost programs was carried out using several methods. First I reviewed the existing state of city-run compost programs in New York, particularly a series of reports published by the New York City Department of Sanitation (DSNY) from 2001 to 2006. Next I researched local, community-organized compost programs. I contacted leaders in each of the four compost program case studies and interviewed them, using a set of standard interview questions as the basis for what became an open-ended conversation. I analyzed the interviews and the four programs based on a set of criteria:

- Effectiveness of waste reduction
- Community engagement possibilities
- Transportation impacts
- Financial benefits and constraints
- Quality of finished compost

The interview questions are included here.

Interview Questions:

How long has this facility/site/location been composting?

How did it get started? Were there any significant obstacles in starting a compost program here?

What materials are you composting?

What methods of compost are you employing?

Describe the staffing plan. Who does the work? What tools are used?

What do you do with the finished compost?

Has there been any opposition from the nearby neighbors? Of what sort? How have you handled the complaints?

What about the quality of your compost? Do you test your finished product for quality? How?

What is the main reason that you run this compost facility (waste management vs. compost as a commodity vs. creating your own for gardening purposes, etc)?

What community-engagement activities take place at this site? (Is it a gathering spot? How frequently? What are the outcomes of that community gathering?)

How are the materials moved to the site, and how is the compost taken away? Where does it go? How far does it travel, and by what mechanism?

How much compost is produced here? How much more could the facility/location handle, and at what point would it be too low in volume to continue composting?

Do you accept organic waste from outside sources? If so, from whom? In what volumes?

What would make your compost operation run more smoothly? What are the significant "roadblocks" and how can they be changed?

In your perception, would it work to compost organic waste from local residents and businesses, at this site or at one like it in NYC?

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